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JURNAL INI DITERBITKAN SEKALI DALAM SETAHUN

Objektif utama jurnal ini diterbitkan ialah untuk menggalakkan kakitangan akademik menerbitkan penulisan ilmiah bagi menambah bahan bacaan yang meliputi ilmu dari pelbagai bidang. Selain itu, usaha ini dibuat agar budaya penulisan dapat dipupuk di kalangan kakitangan akademik sesuai dengan tarafnya sebagai sebuah universiti.

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KANDUNGAN

DARIPADA KETUA PENYUNTING

Assalamualaikum Warahmatullahi Wabarakatuh

Y.A.B. Dato' Seri Setia Di Raja Dato' Seri Syed Razak Syed Zain, Menteri Besar Kedah telah melakukan lawatan rasmi ke UiTM Cawangan Kedah pada 3 Julai 2003 yang lalu. Sempena lawatan beliau, Pengarah Kampus telah memberi taklimat mengenai kemajuan dan sumbangan UiTM Cawangan Kedah melalui penyelidikan dan perundingan terhadap negara khususnya negeri Kedah. Kata alu-aluan Y. Bhg. Dato' Naib Canselor UiTM dalam buku "UiTM Kedah Sepintas Lalu" sempena lawatan Menteri Besar Kedah telah menekankan peranan UiTM terhadap negara terutamanya dalam bidang penyelidikan dan perundingan untuk membantu kerajaan negeri bagi memajukan negeri masing-masing. Oleh itu, satu saluran perlu diwujudkan bagi mendokumentasikan hasilan penyelidikan dan perundingan supaya ianya boleh dijadikan sumber rujukan oleh semua pihak yang berminat.

Justeru itu, UiTM Kedah telah menerbitkan jurnal akademik bertajuk 'Wahana Akademik' untuk menampung keperluan penerbitan tersebut. Untuk itu, Jawatankuasa Jurnal Akademik, Universiti Teknologi MARA Cawangan Kedah amat mengalu-alukan hasilan penulisan akademik samaada hasil penyelidikan dan perundingan ataupun analisa *'literature'* untuk dimuatkan dalam penerbitannya.

Wan Faizah Wan Abdullah

IMPROVING MATHEMATICS TEACHING AND LEARNING

WAN ZULKIPLI WAN SALLEH
WAN SITI ESAH CHE HUSSAIN

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ABSTRACT

This article gives suggestions to enhance the teaching and learning of mathematics. Mathematics is widely considered among the difficult and unappealing subject which has resulted in a syndrome of anxiety. By taking students' attitude and belief into consideration, this paper offers remedies to change their perceptions towards mathematics. It also highlights the students' responsibilities to improve their understanding of this subject. This paper also points out the importance of using different approaches to accommodate the diverse abilities among students and lastly, it discusses the significance of knowing how to read mathematics texts in improving the learning of mathematics.

Key words **:** ***Teaching and Learning of Mathematics, Perception towards Mathematics, Mathematics Text.***

INTRODUCTION

Mathematics is studied at all levels, starting from kindergarten to higher institutions. Whether we are pursuing a degree in mathematics or not, almost all disciplines, from engineering to business programmes have mathematics as their course requirement. This shows that mathematics is an important subject. It has also been widely known that students have some kind of phobia when it comes to learning mathematics. This prejudice springs from the feeling of helplessness when failing to solve mathematics problems. If this phenomenon is left unattended and no action is taken by educators and learners to overcome it, it will lead to feelings of frustration and result in a negative attitude towards mathematics. Moreover, it will lead to students view mathematics as an unnecessary chore and they are afraid of it. This negative perspective would significantly affect their achievement in mathematics and may affect their future career (Gilroy, 2002). So, mathematics educators have to take the challenge to present this subject as interestingly and creatively as possible in order to develop the desirable attitude and perception among students towards the subject. No doubt, along the way, we will find students with mathematics learning disabilities, but effort should be focused on overcoming those problems. Students should always be given the opportunity to flourish mathematically. Educators should help them to become competent learners and users of mathematics.

THE SUBJECT

Mathematics has a reputation of being a boring subject, meaningless and irrelevant to daily life (Frid, 2001). Having this negative perspective, students become less interested and unmotivated to study mathematics. They regard mathematics as a subject taken to fulfil the school requirement. They see no connection between mathematics and their chosen professions. This trend of thought has not changed until now. They keep asking teachers why they are learning all these when they see no connection with their life. Students do not recognize the significance of mathematics in their everyday life. Why is this happening? Arthur E. Schwartz, a professor of mathematics at Mercer County Community College in New Jersey pointed out that educators keep teaching math without any applications to the real world or students' chosen professions (Schwartz in Gilroy, 2002). The students believed that they would never use it in the future. From talking to students, Schwartz found out that they think only engineers and physicists use mathematics (Gilroy, 2002). They do not know that mathematics is needed in wider areas such as business, law and medicine (Gilroy, 2002). Educators should start thinking to find a remedy for this problem. They have to innovate their approach by including examples of the related areas in everyday life. By doing this, students will see the relevance of studying the subject. Here is an example of a project undertaken by a primary school teacher to inculcate a positive perception towards mathematics among her students.

By supervising a project similar to 'Math Curse' (1995) written by Jon Scieszka, a teacher in Mount Laurel School District, Mount Laurel, New Jersey, Stephanie M. Berry stimulates her fifth-grade students' interest and realization that mathematics is everywhere. She succeeded in making her students realized that from the time we wake up in the morning until nightfall, we are dealing with mathematics or its concepts. Students were asked to write down several mathematical problems they encounter throughout the day in story form accompanied with solutions. They were to create word problems using a variety of concepts and chosen topics in the curriculum. The following is an example of a story problem presented by her student: " I have three shirts: one with Hippo, one with Devil Dogs and one with Teddy Bears. I have four pairs of shorts: one green, one blue, one black and one gray. How many different combinations can I make with these shirts and pants? And it takes me 7.5 minutes to put on the Devil Dog shirt and the blue shorts with the tricky zipper, how fast can I get into the Hippo shirt and the green shorts, if I can do it in half the time it took me to get into the devil dog shirt and the blue shorts?" (Berry, 2002). This example clearly shows that students are actually capable of thinking creatively and given the opportunity they can explore deeper and finally will find that mathematics is everywhere in our life. We use it everyday without realizing it. Through this project, she managed to encourage her students to explore mathematical concepts and skills, which resulted in the realization of how useful mathematics is. In the conclusion of her assignment, she pointed out the need for and the importance of immersing students in real-life mathematics applications to help them apply basic and higher-level concepts and skills (Berry, 2002). The project proved to children that mathematics can be fun and is applicable to their daily lives. This will thus change their negative perceptions and initiate a motivation to study mathematics. If we are able to point out to students how useful mathematics is in our everyday life, it will motivate them to learn more.

There are a lot of other examples of applications of mathematical concepts in the area of business, engineering and architecture. For example, mathematical concepts of differentiation and integration are widely used in engineering, simple interest and compound interest are used in banking systems and so on.

Learning mathematics is not similar to other subjects. Mathematics is full of concepts, symbols to be understood, operations for computations to be comprehended, graphics to be interpreted and theories to be proven before they can be applied in solving problems and real life situations. Students have to have the desire to succeed for them to be able to learn math enjoyably and confidently. Encouragement by educators should always be given to them to pursue the subject steadily, as along the way they are prone to be disappointed with failures or are unable to understand certain materials. By being supportive, students will be less anxious and at ease towards mathematics. We have to try to develop self-confidence among the students, as this is closely associated with the intrinsic motivation that would gear the students to keep going to establish a positive perception and attitude towards mathematics. Through careful observation, we can see the students' mathematics performance behaviour as they move from one level to another. There will be ups and downs but we have to instill confidence, open mindedness and willingness to accept defeat and failure. Giving enough attention to problematic students is essential. Those who have good experience with mathematics will develop a positive attitude, and will be less math-anxious and thus become more comfortable and confident when facing challenging problems (Middleton and Spanias, 1999). However, if they have developed a negative perspective towards mathematics, they will generally try to avoid it. Feelings of inadequacy and of incompetence to do mathematics make them put no effort into understanding and studying it. If they can accept failure as a challenge, they will not become frustrated and shy away from math. We don't want them to be forced to study mathematics, only because it is a compulsory subject. Our objective is to make students enjoy learning mathematics.

In order to carry out the responsibility of teaching young minds to understand the abstract concepts of mathematics, educators have to bear in mind that there is no perfect method of teaching mathematics. Children's ability varies from one individual to another, so is their way of thinking and reasoning (Robin, 2002). They also learn at a different pace. Teaching is always an on going learning experience especially for the younger children. Educators will have to use as many different approaches and methods as possible in order to cater for the diversity of the young minds. They should always be on the look out for any learning disabilities detected among the students. By being on the alert for mathematics learning disabilities, educators can tackle the problem at the initial stage as soon as possible. With prompt action, they can straighten whatever problems the students encounter before they become severe. Examples of learning disabilities that need prompt actions include being unable to solve algebraic problems, problems with multi-steps and basic computational problems like adding and subtracting negative numbers. Besides, educators should also bear in mind that they must always keep the balance between skills, concepts and problem-solving when presenting the materials to the class. This will help students digest the materials presented smoothly. Another important aspect that educators should be aware of

is to take some time to look at mathematics in the same way as the students look at it. It will let us understand why students have difficulties to comprehend certain areas of the subject. When we can place ourselves in their position, we can review our strategies and approaches to accommodate their understanding. Moreover, mathematics is a sequential subject. Knowing and mastering the earlier material starting from counting in kindergarten to the simple operations and application problems in lower primary school (Years 1-3) play an important role in making students understand and be able to grasp the mathematical concepts in advanced courses besides inculcating a positive attitude and stimulating interest in mathematics. The educator who teaches the lower grades has to make an extra effort to give a clear understanding of mathematical concepts.

STUDENTS' ATTITUDE AND BELIEF

A lack of self-confidence and feeling incapable of doing well in mathematics tend to make students withdraw from taking serious part in learning it. This is more noticeable among higher grades or older students. Studies on this subject found that primary school students seem to enjoy mathematics but as they progress to higher grades, the number of students who find mathematics an enjoyable subject decreases sharply (Middleton and Spanias, 1999). It was also found that the lower grade students initially believed that they were competent to do math and hard work would enable them to succeed but when they grew older, they noticed that those who succeeded in mathematics were smart students. So, they perceived mathematics as a special subject. Those who are not smart enough only manage to 'get-by' while others fail. They tend to associate success in mathematics with ability only. They begin to differentiate between ability and effort. Once they label themselves as incapable of solving mathematics problems, they become unmotivated. They will refuse to put in the extra effort as they consider it as waste of time or fruitless.

Instilling confidence and being able to accept failure in learning mathematics are crucial at this stage. Teachers and educators have to make students realize and perceive success and failure as not attributable only to ability or being smart students. Average students will still have the chance to succeed provided they are willing to change their attitude and accept failure as a challenge. Teachers have to make students see that failures are acceptable in learning mathematics. Once students digest this belief, they will become more confident and are willing to spend more effort. Research by Klocsterman (1988) (Middleton and Spanias,1999) found out that when students realized that having occasional failure in learning mathematics is acceptable, it gave rooms to students to struggle with challenging problems and not be shattered when they were unable to solve them. Once students have self-confidence in mathematics, they will be willing to put in the extra effort. That means putting in an extra 3 to 4 hours a week to study math will not distraught the students but it becomes a pleasurable event to go through.

Lack of practice will make students feel uncomfortable, unsure what approach to use, confused about which formula to choose and thus become panicky and tense when students are given problems to solve especially in the examination room. By doing more and consistently, students will become more familiar with the particular topic, feel confident to tackle related problems and are prepared to take on more

challenging questions. Practicing does not mean that students have to solve the same problems over and over again. We do not want to set a pattern in the mind of the students because if they follow a pattern, they will tend to exclude other methods or become helpless when questions are twisted or presented differently. As quoted by Charles Reeves, patterns have a negative effect on learning because it will create a situation where students will become rigid and refuse to apply other ways to solve new tasks (Reeves and Reeves, 2003). Trying to solve as many different formats of questions on the specific topic as possible is what is meant by practice. Educators should always encourage students to diversify their approach to find the simplest and shortest method to solve a problem. This will then prevent students from establishing the routine blindly without knowing the reasons for the steps taken. Students can discover a more appropriate way to tackle a problem when they have had a lot of practice. Students must be taught to follow step by step until they are competent to solve problems flawlessly. Then, students should be given the opportunity to try other ways that they think are right as an alternative approach. An educator can help students by maintaining a nice balance between developing skill and encouraging creative approaches to routine ones (Reeves and Reeves, 2003). It will give students the chance to work out problems smartly.

TEACHING STRATEGIES AND PRACTICE

A lot of teachers and educators sometimes find it difficult to convey the mathematical concepts especially those involving abstract thinking and proving. With a lot of materials to cover within a specific time, the pace maybe too fast and students cannot follow what is being taught. One cannot deny that there are syllabuses to complete, but educators should always take their students' achievements in mathematics in previous grades into consideration when developing his or her lesson plan. There are slow learners who need more time and elaborate explanation to understand. So, when designing a lesson plan, teachers have to consider their students' various abilities in understanding mathematics. Educators should remember that each individual has different ways of thinking and reasoning. It should be written in a format that maximizes students' understanding. Studies on how mathematics is taught in Japan found that lessons are designed using the explore-invent-discover method where it maximizes students' activities and minimizes the teacher centred approach while mathematics lessons in the United States and Germany are taught similar to our practice in Malaysia. The teacher does most of the mental work or provides answers and solutions. This method is not wrong, but every now and then, one should introduce a new way. The 'explore' method or also known as constructivism carried out in Japan starts with a teacher presenting a concept for exploration in a format of problems and students are asked to work individually or in group to discuss the solution using their prior knowledge. Students will then present their solution to the class. The whole class will participate in discussing and evaluating the solutions. The teacher will play a role in highlighting the main ideas and underlining the conclusion. Undergoing this lesson helps students to formulate for themselves implicit ideas and concepts and thus extending these to new concepts and applications (Martinez, 2001) . It will provide students with the opportunity to construct new knowledge and understanding from previous knowledge. It will also stimulate students' natural curiosity. In the Third International Mathematics and

Science Study (TIMSS) competition result, it was found that the Japanese students' scores were higher than the American and German students' (Martinez, 2001). The difference in the teaching approaches between those countries and the scores obtained proved that teaching approaches and strategies play an important role in developing critical mathematical thinking individuals. Students will be more capable of exploring, developing and discovering multiple solutions to more challenging problems.

Another major problem faced by our students is their difficulty in understanding mathematical language, the terminology and definitions. An experiment testing students' understanding of basic algebra and calculus terminology carried out by Nelan gave a shocking result (Nelan, 1997). Many students were unable to point out the definite meanings of the terms used. His study also showed that the students were not making serious efforts to understand the meanings and definitions and even avoid reading mathematics texts. What they were interested in was only the way to solve problems by memorizing the steps. They did not realize that understanding the basic vocabulary is important to comprehend the nature of mathematics problems. Understanding the basic terminology and terms is vital to understand not just how to do math but also to comprehend the concept and thus extend it in application (Nelan, 1997). It can help to make sense of the abstract concepts (Nelan, 1997). Educators should encourage students to read mathematics textbooks and references and try to understand the terminology and how to use it correctly. Teachers can help and teach students how to read texts correctly because a mathematics text is quite difficult to comprehend since it is full of concepts, mathematical signs, symbols and graphics. They can start by incorporating reading and learning strategies that help students use their previous knowledge and then help student master the vocabulary to make sense of the unfamiliar terms, terminologies and new information. Students then can blend their prior knowledge with the new concepts to understand better by making logical connections and assimilations. Students also need to read and at the same time interpret them. By teaching them how to pick out points and main ideas, it will help them to make sense of what they are reading (Barton, Heidema and Jordan, 2002). Besides text books, students should also be encouraged to read references which are abundantly available in all types of media, for example, online and interactive CD-ROM. These references are user friendly. They are written in an interactive way where students feel like somebody is talking to and tutoring them. Sentences used are simple and easy to comprehend.

CONCLUSION

As a conclusion, we as educators should play a serious role and make the effort to establish a strong tie with students in order to gain their confidence in our subject and us. We should make them at ease with us to create a conducive environment for them to consult us regarding any difficulties or problems they encounter. Instilling confidence in them is very important. Educators can help them build self-confidence in mathematics by helping them to overcome their anxiety and showing them that failing in math is not the end of the world. We can ask them to start learning math by building on their past experience and then reinforcing their achievements (Dalby, 2001). We should also help students to learn and become autonomous learners. Besides that, helping them with other study skills like time

management, critical reading skills in dense mathematics texts and problem solving skills can help them gain confidence and self-efficacy.

Educators must always remember, "The goal of good teaching is student learning." (Dalby, 2001)

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